WATER Quality
K-STATE Kansas State University

Sodium in Drinking Water

The U.S. Department of Health and Human Services and U.S. Department of Agriculture recommend that Americans reduce their sodium intake. Too much sodium intake in food and water has been identified as a contributor to high blood pressure. Nine out of 10 middle-aged Americans will develop high blood pressure during their lifetime.

The American Heart Association and National Academy of Sciences recommend sodium levels between 500 and 2,400 milligrams (mg) per day. However, sodium less than 1,800 mg is belived to be healthier. This (1,800 mg) is obtained from 3/4 teaspoon of table salt, sodium chloride. But, typical Americans consume about twice this amount of sodium in food and drinks.

Sodium and Health

About 42 million adults, 20 percent of the population, have persistent high blood pressure (hypertension). About half of those with high blood pressure are sensitive to sodium and can reduce blood pressure by reducing sodium. Although some people can consume excessive levels of sodium without increased blood pressure, many cannot. Other risk factors for high blood pressure include excess weight, alcohol consumption, and a family history of high blood pressure. Many scientists believe sodium sensitivity is inherited. If this is true, susceptible people may be able to avoid hypertension by minimizing high sodium intake (limiting dietary sodium to less than 1,800 mg per day).

High levels of sodium may aggravate existing high blood pressure. Factors to help reduce high blood pressure include a low sodium diet, increased fruit and vegetable consumption, exercise, weight control, and medication if necessary.

Studies of more than 20 cultures worldwide, from Greenland Eskimos to natives of the Solomon Islands, show that hypertension is rare in populations using little salt. Kung bushmen of Africa and Yanomamo Indians of Brazil have virtually no hypertension. Their diets are extremely low in salt. Their blood pressure does not rise with age as it does in people who live in industrialized societies.

By contrast, in countries where people consume large amounts of salt, hypertension is a serious concern. People in northern Japan, where salt is used as a food preservative, are among those with the highest incidence of high blood pressure. They may consume 30,000 mg (1/8 cup) of salt each day, about 60 times as much as 500 mg for the African and Brazilian tribes.

Excess salt in the diet causes increased sodium in the blood. In some people the volume of blood increases, thus causing blood pressure to increase and the heart to work harder. The danger of high blood pressure is possible damage to the heart and arteries, which may result in heart attack, stroke, or possible damage to other body organs.

Sodium in Diet

About 15 million people in the United States have a daily diet characterized by moderate to severe restrictions for sodium intake. Most foods and beverages contain some sodium. Many foods, such as meat and milk, contain sodium naturally. However, sodium is also added in processing, preserving and preparing food. More than 100 times as much sodium is added to some foods during processing than is contained in the food ingredients (see Table 1). Sodium is often highest in convenience snacks and processed foods.

Many people have acquired the taste for salted food and use the salt shaker liberally to satisfy this taste. Because the average person in this country consumes several times the recommended daily allowance for sodium, most of us would be healthier with reduced sodium consumption. We could all educate ourselves about the benefits of a reduced sodium diet, wean ourselves from the taste of salted foods, and reduce the use of salt.

Sodium in Water Supplies

The Environmental Protection Agency (EPA) has a draft guideline for sodium in drinking water of 20 milligrams per liter (mg/L). Sodium in Kansas public water supplies varies from less than 10 to more than 300 mg/L. To find out how much sodium is in your public water supply refer to the most recent Consumer Confidence Report for your water supply, or

Table 1. Sodium in Some Common Foods

Food	Weight (grams)	Sodium (mg) LS	Reg.
Frankfurter (2), beef and pork, 10/pkg	100	-	1008
Cod, poached, no salt	100	-	61
Salmon (canned), drained	100	75	487
Tuna (canned), in oil, drained	100	50	354
English muffin	57	-	264
Bread (slice)	25	34	126
Crackers (Low sodium vs. saltines)	30	198	390
Dry cereal*	30	2	275-350
Cooked cereal	100	1	200-285
Cheese, American Processed	30	3	430
Cheese, cheddar	30	-	85
Cottage cheese	30	4	120
Whole milk (8 oz)	240	-	120
Hot chocolate (8 oz)	240	-	175
Peanut butter (I Tbs)	15	1	73
Pork and beans, canned	100	-	440
Diet soda* (12 oz)	360	-	20-70
Regular cola* (12 oz)	360	-	14
Butter	5	1	41
Margarine	5	0-1	37-47
Mayonnaise and Mayonnaise type	15	17	85-180

*variation among brands may be considerable; read label.

contact your water supplier. K-State Research and Extension publication, *Sodium in Public Water Supplies*, MF-1114 has a list of sodium content for most public water systems. People with private water supplies need a water test to determine the sodium content of their water. Keep in mind that concentration may change with groundwater recharge, contamination and water use.

The American Heart Association (AHA) suggests that the 3 percent of the population who must follow a severe, salt-restricted diet should not consume more than 500 mg of sodium a day. AHA suggests that no more than 10 percent of this sodium intake should come from water. The EPA's draft guideline of 20 mg/L for water protects people who are most susceptible.

Home Water Softening May Increase Sodium

When water is softened at home, it is done by passing the water through a bed of ion-exchange media that replaces hardness minerals (calcium and magnesium) with sodium or potassium. Most softeners add sodium to softened water. However, softeners that recharge with potassium do not add sodium; only softeners that recharge with sodium chloride (salt) add sodium to water. Most public water systems that soften water use a process that precipitates the hardness minerals that settle and are filtered rather than using ion exchange.

Hardness is reported as grains per gallon (gpg), milligrams per liter (mg/L), or parts per million (ppm). One grain per gallon equals 17.1 mg/L, or ppm. To determine the amount of sodium a home water softener adds, use water hardness in grains per gallon (gpg). If your water test is reported in milligrams per liter or parts per million, convert it to grains per gallon by dividing by 17.1. Ion exchange softening adds about 8mg/L of sodium to the water for each grain per gallon of hardness removed (8 mg/L/gpg). To find the sodium in your softened water use the formula:

Sodium added (mg) = volume of water you drink (L) x hardness removed (gpg) x 8 mg/L/gpg.

Example: A person who drinks two liters (2L) of softened, extremely hard water (assume 30 gpg) will consume about 480 mg more sodium (2L x 30 gpg x 8 mg/L/gpg = 480 mg), than if unsoftened water is consumed.

Reducing Sodium in Drinking Water

It may be easier and more practical for many people to reduce sodium in their drinking water rather than in their food. Anyone on a sodium-restricted diet certainly should avoid as much sodium in water as possible. Even for healthy people it may be more practical to limit excess sodium in drinking water rather than from food. Controlling sodium in drinking water involves two steps – knowing how much is in the water supply and avoiding sodium added by softening. Because much of the groundwater in Kansas is hard or extremely hard, softening can add significant amounts of sodium.

The easiest and least expensive way to avoid sodium from water softening is to drink unsoftened water. This can be done by supplying unsoftened water at the cold water faucet or a separate bypass faucet. Another option is to use bottled water for drinking purposes. However, not all bottled water is low in sodium, so read the label or contact the bottler to find the sodium content. We recommend that you choose a water that is less than 20 mg/L.

Finally, water treatment may be a practical way to remove sodium and other minerals, whether natural or added by softening. Reverse osmosis or distillation are the treatment options. See Extension publications, *Reverse Osmosis*, MF-884, and *Distillation*, MF-885.

If the liquids you drink each day have less than 100 mg/L of sodium, it probably adds less than 5 percent of the sodium content of the average adult's diet. People whose water has more than 100 mg/L of sodium may want to consider taking steps to reduce sodium in their water. The methods mentioned above apply. Remember, the average person wanting a healthier life should also reduce sodium (salt) in foods, especially snack foods and beverages.

High Perspiration and Sodium

When people perspire, they loose sodium from their body. However, most people who perspire a lot do not have to increase their sodium intake significantly because most are already consuming enough. Those who perspire profusely may need to drink more than 4 quarts of liquid a day to replace the water lost through perspiration. Most athletes and laborers obtain adequate sodium from food at meal times, or by using the salt shaker at the table if food is low in salt.

Additional Information Sources

Attitudes and Actions: American's Diet and the Dietary Guidelines For Americans, 2000. USDA-ARS *www.barc.usda.gov/bhnrc/foodsurvey/2000dga.html*

Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approach to Stop Hypertension (DASH) Diet. New England Journal of Medicine, Vol. 334 No. 1, Jan. 4 2001.

The Effects of Home Water Softeners: Added Sodium May Be Hazardous to Your Health. Gopal Das, MD. Janine Finis Journal of Environmental Health, Vol. 50, No. 7, July/August 1980.

Too Much Salt. Consumer Reports, p. 48-50, January 1990.

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